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By-Houston, Samuel R.; Roscoe, John T.

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Graduate schools must develop new criteria for identifying potentially talented individuals. Judgment analysis (JAN) uses a criterion of success, derived from the judgments of a group of experts, for graduate student selection. In considering a number of applicants for a position, a judge examines each applicant's scores for various profile variables or predictors relevant to a particular job. The judge studies the qualifications of each applicant and ranks each by means of an overall score or judgment. Each judgment thus becomes the applicant's criterion score for the set of profile items or dimensions used as predictors. The procedure results in a series of zero-order validity coefficients relating each individual predictor variable to the criterion. A computer analysis procedure reduces the number of judges, until all judges are grouped in a single cluster. Normative JAN and ipsative JAN, two variations of the JAN technique were studied. Normative JAN sought to determine the extent to which a policy regarding graduate admission standards existed among twenty representative faculty members. Each judge ranked the student on the basis of his profile variables. Ipsative JAN used for its criterion variable the judges' rankings or judgments based on personal knowledge as opposed to profile data information. (PS)

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THE USE OF THE JUDGMENT ANALYSIS TECHNIQUE IN PREDICTING SUCCESS IN GRADUATE EDUCATION

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By

Samuel R. Houston
Institute for Development of Educational Activities
Research and Development Division
Los Angeles, California

and

John T. Roscoe
Colorado State College
Greeley, Colorado

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THE USE OF THE JUDGMENT ANALYSIS TECHNIQUE IN PREDICTING SUCCESS IN GRADUATE EDUCATION

Samuel R. Houston and John T. Roscoe

Today graduate schools are faced with the serious problem of finding and training more and better graduate students for teaching and research. In view of this need, it would be naive to suggest that they raise their standards and select only the intellectual elite. By raising graduate admission standards and allowing only a select few to filter through graduate program, a substantial number of potentially talented individuals have been eliminated from graduate study. Graduate schools instead must increase their resourcefulness and seek out new ways to identify potentially talented individuals who have escaped selection under the old criteria.

A review of the literature reveals that there is a scarcity of studies related to the problem. For the most part, studies in predicting success in graduate education have followed the same basic design: aptitude and achievement tests commonly required of applicants to graduate schools for the total population of a specified group are correlated with cumulative grade-point average (GPA), year-by-year GPA, GPA on various subsets of courses, and other varia-

tions of GPA. Coefficients of correlation have been statistically significant but they have not been efficient in forecasting power. In general, studies have grouped graduate students together and have ignored the variable of the major department in which graduate students are enrolled. Criticisms of using the GPA as criterion of success have been made both in terms of its appropriateness as well as with the limited range of grades in graduate school.

JUDGMENT ANALYSIS

A new promising technique which avoids the criticisms mentioned above was described in 1961. Now called Judgment Analysis or JAN, it uses a criterion of success derived from the judgments of a group of experts. JAN is an adaptation of methods developed by Ward and by Bottenberg and Christal which groups criteria in terms of the homogeneity of their prediction equations. It gives the admitting school a standard for deciding whether to accept a given student: that standard is a policy which they have created themselves. The policy is described by the weights to be applied to scores obtained on the various profile items or admissions data.

How is the JAN technique used? In considering a number of applicants for a position, a judge examines each applicant's scores for various profile variables or predictors relevant to a particular job. Instead of evaluating the relative importance of each profile item and weighting the predictor variables to form a selection battery, the judge studies the qualifications of each applicant

and ranks each by means of an overall score or judgment. Each judgment thus becomes the applicant's criterion score for the set of profile items or dimensions used as predictors. The procedure results in a series of zero-order validity coefficients relating each individual predictor variable to the criterion.

After the criterion scores have been recorded for all the judges, the first step in the analysis procedure is to compute a least squares solution of a multiple regression equation to predict the criterion scores given by each judge, using the profile items as predictors. Christal (1963) discusses the criterion-grouping techniques in some detail. Using the R^2 computed for each individual, unacceptable raters may be eliminated by comparing the R^2s computed from their equations with the R^2s obtained for the other judges in the sample. Next, a single value of R^2 is computed to indicate the overall predictive efficiency when all the individual judges who have the most homogeneous equations are located. The computer prints the single equation that best represents the joint policy of these two judges as well as the loss in overall predictive efficiency that results when the N original equations are reduced to N-1 equations. The process continues systematically to reduce the number of judges by one at each step until all judges have been grouped into a single cluster. At each step, examination of the loss in overall predictive efficiency (the reduction in R^2) makes it possible to identify the different policies which may exist.

NORMATIVE JAN

Two variations of the JAN technique for predicting success in graduate school were investigated--Normative JAN and Ipsative JAN. Normative JAN sought to determine the extent to which a polity regarding graduate admission standards

existed among twenty representative graduate faculty members at Colorado State College. The selected graduate faculty members who served as judges responded to profile data on thirty randomly selected doctoral graduates who graduated between 1963-1966. Each judge was asked to rank each student on the basis of his profile variables with one of five scores. A score of five indicated that the judge thought the student would probably graduate in the top fifth of the class for a particular year; a score of one indicated a judgment that the student would graduate in the lowest fifth. Sixteen of the judges, that is, 80 percent responded.

LIST OF NORMATIVE JAN VARIABLES

1) Normative-JAN criterion
2) Colorado State College master's degree
3) Cumulative grade point average
4) Years between B.A. and M.A. degree
5) Rating on Interview
6) Recommendation on Interview
7) Sex
8) GRE-Verbal score
9) GRE-Quantitative score
10) GRE-Social Science score
11) GRE-Humanities score
12) GRE-Natural Science score
13) GRE-Advanced Education score
14) English Usage Test score
15) Education Major
16) Science Major
17) Psychology Major
18) Business Major
19) Music Major
20) Industrial Arts Major
21) Physical Education Major
22) Other Major Field

Basically, the profile variables can be grouped into three subsets: (a) biographical data (variables 2-7 inclusive); (b) test data (variables 8-14 inclusive); and (c) major field data (variables 15-22 inclusive). The predictor variables were selected because they represented readily accessible information which might have

some predictive relationship to a criterion measure of graduate school success; in this case, the criterion measure utilized was the judgment score expressed by the graduate faculty members serving as judges. The three highest zero-order correlations between predictor variables and the criterion variable are Other Major Field (-.83), Physical Education Major (-.71) and Music Major (-.66).

A least squares solution of a multiple regression equation to predict the criterion decisions given by each judge gave an R^2 of .8580 which indicates the overall predictive efficiency. A multiple correlation using the twenty-one independent variables as predictors of the Normative-JAN criterion was .93. Not only is this significant at the .01 level, but it is exceptionally high from a predictive viewpoint: approximately 86 percent of the criterion variance is thereby explained. The high R^2 indicates that the interrater agreement is exceptionally high - - especially considering the categorical criterion - - and that, essentially, one policy is being expressed by the judges.

In order to investigate the efficiency of the prediction when certain groups of predictors were removed from the system, the investigators used multiple linear regression, according to Ward (1962), to determine the unique contribution of proper subsets of the predictor variables, (2-22), to the prediction of the criterion. The contribution of a set of variables to prediction may be measured by the difference between two squares of multiple correlation coefficients (R^2s), one obtained for a full regression model (FM), and the other obtained for a regression equation in which the proper subset of variables under consideration has been deleted; this model is called the restricted model, (RM). The difference between the two R^2s may be tested for statistical significance with the variance ratio test.

Approximately 59 percent (.5928) of the criterion variance is estimated

to be attributable to the thirteen variables which essentially consist of biographical and test data and this in turn, leads to an estimate of approximately .26 for the unique contribution of variables (15-22) as a group. This was significant at the .01 level. Similarly, the unique contribution of the seven predictor variables involving test data (8-14) is estimated at .0453 and was significant at the .01 level. Finally, an estimate of .0377 is given as the unique contribution of the six predictor variables involving biographical data (2-7) and this contribution was significant at the .01 level.

IPSATIVE JAN

Ipsative JAN used for its criterion variable the rankings or judgments submitted by the judges who ranked the doctoral graduates on the basis of personal knowledge as opposed to profile data information. The judges were requested to select the names of ten students about whom they were knowledgeable and then to rank (without access to profile data information) these students in terms of their estimate of the student's professional promise. The names of the students were selected from a list of 231 recent doctoral graduates at Colorado State College during the same period, 1963-1966. Sixteen judges, or 80 percent, responded; however, one judge ranked only eight students.

LIST OF IPSATIVE JAN VARIABLES

1) Ipsative-JAN criterion
2) Colorado State College master's degree
3) Cumulative grade point average
4) Years between B.A. and M.A. degree
5) Age doctorate received
6) Sex
7) GRE-Verbal score
8) GRE-Quantitative score
9) GRE-Social Science score
10) GRE-Humanities score
11) GRE-Natural Science score
12) GRE-Advanced Education score

13) English Usage Test score
14) Education Major
15) Science Major
16) Psychology Major
17) Business Major
18) Music Major
19) Industrial Arts Major
20) Physical Education Major
21) Other Major Field

Essentially, the three groups of predictor variables investigated were (a) biographical data (variables 2-6 inclusive); (b) test data (variables 7-13 inclusive); (c) major field data (variables 14-21 inclusive). The biographical items in the Ipsative JAN study differ slightly from the biographical variables in the Normative JAN study because of missing data.

The Ipsative JAN technique was not used to determine the extent to which a policy may or may not be present. It is doubtful that one could claim a policy exists in terms of the predictor variables when each judge was requested to give his rating on the basis of a subjective knowledge of the individual and not on the basis of any profile data (predictors). Primarily, the purpose was to determine the amount of the relationship between the available predictor information and the Ipsative JAN criterion.

The three highest zero-order correlations between the predictor variables and the Ipsative JAN criterion variable are GRE-Advanced Education (.30), GRE-Verbal (.26), and English Usage (.24). The 20-variable composite accounts for .1700 of the total Ipsative JAN criterion variance. A multiple correlation using the twenty independent variables as predictors of the criterion was .42. While this is significant at the .01 level, it is low from a predictive point of view; approximately 83 percent of the variance is unaccounted for when the twenty variables are used as predictors.

Approximately 16 percent (.1591) of the criterion variance is estimated to be attributable to the thirteen variables which essentially consist of biographical (2-6) and test data (7-13). The loss in predictive accuracy when major subject field data are not considered does not seem sufficient to be of practical importance. The unique contribution of the eight predictor variables (14-21) involved with identifying the major subject field was not significant at the .01 level. A similar approach shows that the unique contribution of the seven predictor variables involving test data (7-13) is estimated at .0700. The loss in predictive accuracy when test data are not considered seems sufficient to be of practical importance even though the unique contribution of the seven predictor variables involving test data information was not significiant at the .01 level. An estimate of .0104 is given as the unique contribution of the five predictor variables involving biographical data (2-6). This contribution was not significant at the .01 level; the loss in predictive accuracy when biographical data are not considered does not seem sufficient to be of practical importance.

SUMMARY

Normative JAN develops a faculty policy for graduate admission and determines the minimum number of policies that may be expressed. The investigators were more interested in determining to what extent a policy had been expressed than in actual regression equations. Consequently, no attempt was made to give an exhaustive analysis of the set and various subsets of predictor variables. Instead, the predictor variables were grouped into three proper disjoint subsets and the unique contribution of each of these subsets was investigated. Results seem to indicate that, essentially, one policy was expressed by the judges using the Normative JAN technique. Furthermore, each of the three disjoint proper subsets contributed significantly to the

prediction of the Normative JAN criterion. This suggests that this kind of admission profile data provides relevant information for judges in policy development.

The Ipsative JAN variation generates an additional criterion of graduate school success; namely, a graduate faculty member's estimate of a student's professional promise. Results were statistically significant though weak from a predictive viewpoint. The multiple correlation obtained, with judgments of graduate faculty members used as a criterion, is essentially the same as correlations obtained when cumulative graduate grade point averages are utilized. Each of the three disjoint proper subsets failed to contribute significantly to the prediction of the Ipsative JAN criterion even though in the case of test data the loss in predictive accuracy seems sufficient to be of practical importance. It might well be that the results of the Ipsative JAN study could provide additional relevant information for judges developing a policy for graduate admission via Normative JAN.

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